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An approach to satisfy pressure and temperature equilibriums at interfaces in compressible multicomponent flows using high-order schemes HIROSHI TERASHIMA, University of Tokyo, SOSHI KAWAI, Institute of Space and Astronautical Science of JAXA, MITSUO KOSHI, University of Tokyo
— We present a formulation for high-order simulations of compressible multicomponent flows using a sixth-order compact differencing scheme and a localized artificial diffusivity. The formulation is designed to satisfy both of pressure and temperature equilibriums at fluid interfaces by introducing additional two equations to the Euler equations. In order to deal with sharp initial condition of density, a localized artificial diffusivity term is introduced to the mass conservation equation. Several one-dimensional problems such as advection of contact and material interfaces and a shock tube problems demonstrate that the present method maintains the pressure and temperature equilibriums and also satisfies the mass conservation property. The localized artificial diffusivity for the mass conservation equation enables to start computations even with severe one-point jump condition, effectively reducing numerical wiggles at the fluid interfaces. Comparisons with a conventional full conservative formulation present the superiority of the present method for preventing spurious pressure/velocity/temperature oscillations at the fluid interfaces. Two-dimensional problems such as the Richtmyer-Meshkov instability demonstrate its multidimensional applicability.

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